

From the INTERNATIONAL BUREAU

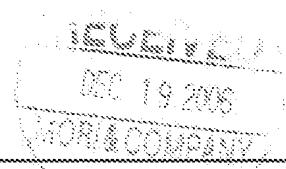
**PCT**

NOTIFICATION OF TRANSMISSION  
OF COPIES OF TRANSLATION  
OF THE INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY  
(CHAPTER I OR CHAPTER II  
OF THE PATENT COOPERATION TREATY)  
(PCT Rules 44(6), 3(c) and 7(2))

To:

**COPY**

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Date of mailing (day/month/year)  
07 December 2006 (07.12.2006)

Applicant's or agent's file reference  
AKK-0071-PCT

International application No.  
PCT/JP2005/003111

**IMPORTANT NOTIFICATION**

International filing date (day/month/year)  
25 February 2005 (25.02.2005)

Applicant  
ASAHI KASEI KABUSHIKI KAISHA et al

## 1. Transmittal of the translation to the applicant.

The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter I).

The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter II).

## 2. Transmittal of the copy of the translation to the designated or elected Offices.

The International Bureau notifies the applicant that copies of that translation have been transmitted to the following designated or elected Offices requiring such translation:

EP, KR

The following designated or elected Offices, having waived the requirement for such a transmittal at this time, will receive copies of that translation from the International Bureau only upon their request:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MO, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OA, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

## 3. Reminder regarding translation into (one of) the official language(s) of the elected Office(s).

The applicant is reminded that, where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability (Chapter II).

It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned within the applicable time limit (Rule 74.1). See Volume II of the PCT Applicant's Guide for further details.

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**TRANSLATION**

PATENT COOPERATION TREATY  
PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>AKK-0071-PCT</b>	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. <b>PCT/JP2005/003111</b>	International filing date (day/month/year) <b>25.02.2005</b>	Priority date (day/month/year) <b>25.02.2004</b>
International Patent Classification (IPC) or national classification and IPC <b>C07C25/22 (2006.01), C07C17/16 (2006.01), C07C35/44 (2006.01), C07D317/70 (2006.01), H01L29/78 (2006.01), H01L51/05 (2006.01)</b>		
Applicant <b>ASAHI KASEI KABUSHIKI KAISHA</b>		

<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <b>8</b> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <b>34</b> sheets, as follows:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 603 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in Item 4 of Box No. 1 and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the report</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>
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Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/JP2005/003111

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on translations from the original language into the following  
which is the language of a translation furnished for the purposes of:

- international search (Rule 12.3 and 25.1(b))
- publication of the international application (Rule 12.4)
- international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *replacement sheets* which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report:

the international application as originally filed/furnished

the description:  
pages 3-8, 8-17, 21, 23, 28, 33, 35 as originally filed/furnished  
pages\* 8-6, 6/1, 7, 7/1, 18-26, 28 received by this Authority on 04.10.2005  
pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

the claims:  
nos. 3-9 as originally filed/furnished  
nos.\* \_\_\_\_\_ as amended (together with any statement) under Article 19  
nos.\* 1,10-21, 24-35 received by this Authority on 04.10.2005  
nos.\* 22, 23 received by this Authority on 12.05.2006

the drawings:  
sheets Fig. 1-3 as originally filed/furnished  
sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_  
sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3.  The amendments have resulted in the cancellation of:

- the description, page(s) \_\_\_\_\_
- the claims, nos. \_\_\_\_\_
- the drawings, sheet(s) \_\_\_\_\_
- the sequence listing (*specify*): \_\_\_\_\_
- any table(s) related to sequence listing (*specify*): \_\_\_\_\_

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, page \_\_\_\_\_
- the claims, nos. \_\_\_\_\_
- the drawings, sheet(s) \_\_\_\_\_
- the sequence listing (*specify*): \_\_\_\_\_
- any table(s) related to sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superceded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

	International application No. PCT/JP2005/003111
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Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																			
<p><b>1. Statement</b></p> <table> <tr> <td style="width: 150px;">Novelty (N)</td> <td>Claims: <u>1-35</u></td> <td>YES</td> </tr> <tr> <td></td> <td>Claims: _____</td> <td>NO</td> </tr> <tr> <td>Inventive step (IS)</td> <td>Claims: _____</td> <td>YES</td> </tr> <tr> <td></td> <td>Claims: <u>1-35</u></td> <td>NO</td> </tr> <tr> <td>Industrial applicability (IA)</td> <td>Claims: <u>1-35</u></td> <td>YES</td> </tr> <tr> <td></td> <td>Claims: _____</td> <td>NO</td> </tr> </table>			Novelty (N)	Claims: <u>1-35</u>	YES		Claims: _____	NO	Inventive step (IS)	Claims: _____	YES		Claims: <u>1-35</u>	NO	Industrial applicability (IA)	Claims: <u>1-35</u>	YES		Claims: _____	NO
Novelty (N)	Claims: <u>1-35</u>	YES																		
	Claims: _____	NO																		
Inventive step (IS)	Claims: _____	YES																		
	Claims: <u>1-35</u>	NO																		
Industrial applicability (IA)	Claims: <u>1-35</u>	YES																		
	Claims: _____	NO																		
<p><b>2. Citations and explanations (Rule 70(7))</b></p> <p>Documents:</p> <p>Document 1: WO 03/016599 A1</p> <p>Document 2: Chemical Society of Japan (Ed.), Daiyouban Jikken Kagaku Kouza 19, Tankasuiso Halogen Kagoubutsu, Maruzen, 1992, pages 438 to 446</p>																				
<p><b>Explanation:</b></p> <p>(1) The Inventions Set Forth in Claims 1 to 35</p> <p>The inventions set forth in claims 1 to 35 are not disclosed in documents 1 or 2, and are therefore novel.</p> <p>(2) The Invention Set forth in Claims 1 to 9</p> <p>The invention set forth in claims 1 to 9 does not involve an inventive step in the light of document 1.</p> <p>Comparing the invention set forth in claim 1 with the invention set forth in document 1, the structural formula represented by chemical formula (I) in the latter contains a polyacene compound represented by chemical formula (I) of the former, but the latter does not specify the polyacene compound represented by chemical formula (I) of the former, which constitutes a difference. The two inventions are identical in other respects.</p> <p>However, document 1 sets forth a compound in which a</p>																				

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

variety of different substituents have been introduced into R<sub>2</sub>, R<sub>3</sub>, R<sub>7</sub> and R<sub>8</sub> (corresponding to R<sub>1</sub> to R<sub>4</sub> in chemical formula I set forth in claim 1) in chemical formula (I), and compounds having fluorine substituted for R<sub>1</sub>, R<sub>4</sub>, R<sub>6</sub> and R<sub>9</sub> in chemical formula (I) (corresponding to X in chemical formula (I) set forth in claim 1), together with the method of synthesizing said compounds. Document 1 also indicates that R<sub>2</sub>, R<sub>3</sub>, R<sub>7</sub>, R<sub>8</sub> and R<sub>1</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>9</sub>, R<sub>10</sub> are both functional groups (page 7, lines 22 to 24); and that these compounds are useful as organic semiconductor thin films, therefore it would be easy for a person skilled in the art to conceive of having the compound set forth in chemical formula (I) described in claim 1 of this application serve as the compound set forth in document 1.

In addition, optimizing reaction conditions such as reaction temperature and the reagent in accordance with differences in and the existence of substituents when synthesizing a compound is a matter which a person skilled in the art could accomplish as necessary.

Next, the effect offered by the invention set forth in claim 1 is examined below.

Document 1 indicates that the carrier mobility of a transistor formed using the compound represented by chemical formula (I) falls within the range of 0.05 to 0.35cm<sup>2</sup>/V·s, and comparing these values to the case wherein the compound of the invention set forth in claim 1 is used, the values set forth in document 1 are equal to or greater than the values of the invention set forth in claim 1 of this application, therefore the carrier mobility of the compound of the invention set forth in

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations regarding such statement

claim 1 of this application does not offer a particular effect.

In addition, document 1 sets forth a method of applying a solution (0.3wt%, for example) with a similar concentration when the compound set forth in claim 1 of this application is used, as a method of forming a thin film of a compound represented by chemical formula (I), therefore the solubility with respect to the solvent of the compound of the invention set forth in claim 1 of this application and the compound set forth in document 1 is understood to be equivalent.

Moreover, the description of this application indicates that the compound of the invention set forth in claim 1 has a halogen element in the molecular structure, and therefore has superior oxidation resistance compared to compounds which do not have halogen elements, but the description does not disclose specific data concerning said effect, and the effect of operation of halogen elements in a molecular structure with respect to oxidation resistance properties is unclear, therefore the invention set forth in claim 1 does not offer an effect with respect to oxidation resistance which would be unexpected to a person skilled in the art.

The same applies to the invention set forth in claims 2 to 9.

(3) The Invention Set forth in Claims 10 to 21

The invention set forth in claims 10 to 21 does not involve an inventive step in the light of document 1 cited in the international search report.

Document 1 sets forth an organic semiconductor thin film having compound represented by chemical formula (I);

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Box No. V Reassessed statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

an organic semiconductor thin film having the principal axis of the molecules of said compound represented by chemical formula (I) oriented in a direction perpendicular to the surface of the substrate; an organic semiconductor device at least partly constituted by said organic semiconductor thin film; and a transistor.

## (4) The Invention Set forth in Claims 22 to 33

The invention set forth in claims 22 to 33 does not involve an inventive step in the light of documents 1 and 2 cited in the international search report.

Document 1 sets forth a method of producing 5,7,12,14-tetrafluoropentacene, wherein pentacenetetron is reduced before being tosylated and fluorinated.

Comparing the invention set forth in claim 22 and the invention set forth in document 1, the two differ in the following aspects: the former is a method wherein in the first stage reaction, a polyacenequinone is reduced to form a hydroxypolyacene derivative, while in the latter there is no mention of said hydroxypolyacene derivative (difference 1), and the former is a method wherein in the second stage reaction, the aforementioned hydroxypolyacene derivative is halogenated and aromatized, while the latter is a method in which tosylation and fluorination is carried out (difference 2), in the former, the raw material polyacenequinone derivative is a structure wherein at least part of R<sub>1</sub> to R<sub>4</sub> in chemical formula (I) has a specific functional group, while the latter does not have said functional group (difference 3). The two inventions correspond in all other aspects.

With regard to difference 1, document 1, as stated

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Box No. V Reasoned statement under Article 36(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

above, sets forth a method of reducing pentacenetetron, and normally a hydroxyl group is generated by the reduction of a carbonyl group, therefore it is understood that in the invention set forth in document 1, the reduction of pentacenetetron generates a corresponding hydroxypolyacene derivative.

With regard to difference 2, as a means of producing halogenated compounds by halogen-substituting a hydroxyl group, a method of directly halogenating the hydroxyl group and a method of initially tosylating a hydroxyl group and subsequently halogenating the product are both known (document 2), and determining whether or not to initially tosylate the hydroxyl group when halogenating the hydroxyl group is a matter which a person skilled in the art could determine as necessary, taking into account the type and yield of raw materials, and the efficiency of the production method. Hence, the tosylation set forth in document 1 is a step which could be selected for the halogenation of the hydroxyl group, therefore it would be easy for a person skilled in the art to constitute the method set forth in document 1 as a method not containing a tosylation step.

In addition, document 1 does not specifically disclose aromatization, but as described above, is a method of producing 5,7,12,14-tetrafluoropentacene by tosylation and fluorination, therefore fluorination and aromatization are understood to be effectively carried out.

With regard to difference 3, document 2 specifically discloses compounds having functional groups in R<sub>2</sub>, R<sub>3</sub>, R<sub>7</sub> and R<sub>8</sub> (corresponding to R<sub>1</sub> to R<sub>4</sub> of chemical formula (I) set forth in claim 22 of this application), and in the

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability:  
discussions and explanations supporting such statement

series of production steps set forth in document 1, in cases where R<sub>2</sub>, R<sub>3</sub>, R<sub>7</sub> and R<sub>8</sub> are alkyl groups or the like, there is no reason why a reduction reaction or fluorination reaction would have an effect on these groups, therefore it would not be particularly difficult for a person skilled in the art to have a raw material polyacenequinone derivative serve as a compound having a functional group in at least part of the positions of R<sub>2</sub>, R<sub>3</sub>, R<sub>7</sub> and R<sub>8</sub> in the production step set forth in document 1.

When doing so, optimizing the reaction conditions such as reaction temperature and the reagent in accordance with differences in and the existence of functional groups is a matter which a person skilled in the art could accomplish as necessary.

The same applies to the invention set forth in claims 23 to 33.

(5) The Invention Set Forth in Claims 34 and 35

The invention set forth in claims 33 and 34 does not involve an inventive step in the light of document 1 cited in the international search report.

Document 1 sets forth a display unit provided with a large number of pixel surfaces, wherein organic semiconductor devices or transistors comprising organic semiconductor thin films containing the compound set forth in chemical formula (I) are provided to each pixel.

In addition, document 1 sets forth a display device wherein the electrode, dielectric layer and semiconductor layer provided to an organic semiconductor device or transistor are formed by printing or applying a liquid.